

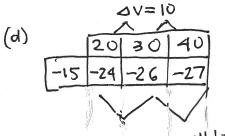
- 1. The wind-chill index W is the perceived temperature when the actual temperature is T (both in degrees Centigrade) and the wind speed is ν (in km/s), so we can write $W=f(T,\nu)$. Values are recorded in the table.
- (a) What is the value of f(-15, 30)? What is its meaning in words (a complete sentence)?
- (b) For what value of v is f(-10, v) = -23? Formulate this question in
- (c) What is the meaning of the function W = f(-15, v)?

		Wit	nd speed	(km/h)		
T	20	30	40	50	60	70
-10	-18	-20	-21	-22	- 23	-23
-15	-24	-26	- 27	-29	- 30	-30
- 20	-30	-33	- 34	-35	-36	-37
25	-37	-39	-41	-42	-43	44

- (d) Evaluate the average rate of change for f(-15, v) for the intervals v = 20..30 and then v = 30..40 and then average these to get a decimal value for the "instantaneous" rate of change of f(-15,v) at v = 30: $\frac{d}{dv} f(-15,v)$ $|_{v=30}$.
- e) Using this result, to what value would you expect the perceived temperature to increase to if the wind speed decreases from 30 km/h to 28 km/h an actual temperature of -15 degrees?

solution

- f(-15,30) = -26. When the actual temperature is -15° C and the wind speed is 30 km/h, the perceived temperature is -26° C.
- f(-10, 50) = -23 so v = 50. At what wind speed is the perceived temperature -23° C when the actual temperature is -10° C.
- When the actual temperature is -15°e, this function gives the perceived (c) temperature as a function of the windspeed in km/n.



$$\frac{\Delta W}{\Delta V} = -\frac{2}{10} \qquad \frac{\Delta W}{\Delta V} = -\frac{1}{10}$$

 $(\frac{\Delta W}{\Delta V})_{ava} = \frac{1}{2}(-.2-.1) = -0.15 = \frac{\Delta W}{\Delta V}$

e) per unit increase in the speed, this derivative gives the change in the value of the function in the linear approximation.

$$\Delta V = 28-30 = -2$$

 $\Delta W = (-0.15)(-2) = 0.3$
 $W+\Delta W = -26 + 0.3 = [-25.7°C]$

The perceived temperature would rise to this slightly higher value.